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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/585,793	07/12/2006	Masahide Shima	03200PCT	6046
23165 7590 04/02/2008 ROBERT J JACOBSON PA 650 BRIMHALL STREET SOUTH ST PAUL, MN 551161511			EXAMINER CHO, JENNIFER Y	
			ART UNIT 1621	PAPER NUMBER
			MAIL DATE 04/02/2008	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/585,793

**Applicant(s)**

SHIMA ET AL.

**Examiner**

JENNIFER Y. CHO

**Art Unit**

1621

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date: \_\_\_\_\_

### Detailed Action

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/12/07 has been entered.

Claims 1 and 3-6 are pending in this application. Claim 2 has been cancelled.

### Claim Rejections - 35 USC 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1 and 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unverricht et al. (US 6,525,217), in view of Hoyt (US 2,558,520).

The instant claims are drawn to a process for producing acrylic acid by vaporizing a material containing an aqueous glycerol solution, containing not more than 20% by weight of water, to generate a first gas. The glycerol and first gas is dehydrated in a gas phase. The gaseous reaction product is then oxidized in the gas phase to acrylic acid.

Unverricht et al. teaches a two-step process for the catalytic gas-phase oxidation of propene to acrolein and then a second reaction of acrolein to acrylic acid (abstract), using molecular oxygen (column 1, line 20). The process uses an inert gas, composed of nitrogen (column 2, lines 27-30), carbon dioxide gas and noble (inert) gas (column 14, lines 37-41). The inert gas can be used to a concentration of  $\geq 50\%$  by volume (column 14, lines 26-29).

Unverricht et al. is deficient in that it does not teach the vaporization and dehydration of an aqueous glycerol solution, containing not more than 20% by weight of water, to a gaseous product.

Hoyt et al. teaches the vaporization and dehydration of an aqueous glycerol solution, containing 5% by weight of water, to acrolein, as a gaseous product (column 2, lines 3-13; column 4, lines 7-11)..

Therefore, it would be prima facie obvious to one of ordinary skill in the art at the time of the invention, to substitute Hoyt et al.'s starting material, glycerol, for Unverricht et al.'s starting material, propene, based on the availability and cost of the starting

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materials and reagents. One of ordinary skill in the art would be motivated to use different starting materials to arrive at the same intermediate product acrolein, with the reasonable expectation that operations would be facilitated and costs would decrease. Absent any showing of unusual and/or unexpected results over Applicant's particular reaction steps, the art obtains the same effect on the purity and yield of acrolein. The expected result would be the efficient production of acrylic acid for the chemical industry.

Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unverricht et al. (US 6,525,217), in view of Hoyt (US 2,558,520), further in view of Unverricht et al. (US 6,403,829).

The teaching of Unverricht et al. (US 6,525,217), in view of Hoyt (US 2,558,520) was discussed earlier.

However, Unverricht et al., in view of Hoyt, is deficient in the sense that it does not teach the production of acrylic acid in a two-stage, tandem-type reactor.

The addition of Unverricht et al. (US 6,403,829) teaches a two-zone tube-bundle reactor (column 10, line 1), which gives a two-stage gas-phase oxidation (column 10, line 27).

Therefore, it would be prima facie obvious to one of ordinary skill in the art at the time of the invention, to utilize the two-zone reactor of Unverricht et al. (US 6,403,829), for Unverricht et al., in view of Hoyt et al's production of acrylic acid from the

dehydration of glycerol, followed by gas phase oxidation of acrolein. The expected result would be the production of acrylic acid from glycerol in high yield.

Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unverricht et al. (US 6,525,217), in view of Hoyt (US 2,558,520), further in view of Uchida et al. (US 4,871,700).

The teaching of Unverricht et al. (US 6,525,217), in view of Hoyt (US 2,558,520) was discussed earlier.

However, Unverricht et al., in view of Hoyt et al. is deficient in the sense that it does not teach the production of acrylic acid in a single-type reactor.

The addition of Uchida et al. teaches a single tubular reactor (column 8, line 41) for the formation of acrylic acid and acrolein (column 8, lines 53-54).

Therefore, it would be prima facie obvious to one of ordinary skill in the art at the time of the invention, to utilize the single tubular reactor of Uchida et al. for Unverricht et al., in view of Hoyt et al's production of acrylic acid from the dehydration of glycerol, followed by gas phase oxidation of acrolein. The expected result would be the production of acrylic acid from glycerol in high yield.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Y. Cho whose telephone number is (571) 272 6246. The examiner can normally be reached on 9 AM - 6 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yvonne Eyler can be reached on (571) 272 0871. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jennifer Cho  
Patent Examiner  
Art Unit: 1621

/Samuel A Barts/  
Primary Examiner  
Art Unit 1621